

date of Mr. Marvin's book produced 60,000,000 gallons of oil, and the supply showed no sign of decreasing. The waste occasioned by "spouting" is at times enormous; millions of gallons of oil being lost from the want of any storage accommodation. Occasionally the neighbouring proprietors who happen to have reservoirs empty may thus obtain the oil at a nominal price. On one occasion 2,000,000 gallons were sold at about $7\frac{1}{2}d.$ per ton. When the Droojba fountain "spouted," the crude article, we are told, altogether lost its value for the moment.

"Fedoroff filled his reservoirs with 2,800,000 gallons of oil for 300 roubles, or £30. . . . Thousands of tons were burnt outside the district to get rid of it; thousands were led towards the Caspian; huge lakes of oil were formed near the well, and on one occasion the liquid suddenly flowed into a distant engine-house, and but for the promptness of the engineer in extinguishing his petroleum furnace the whole locality would have been ablaze. Houses were completely buried by the sand cast up by the oil; all efforts to stop the fountain on the part of Baku experts were fruitless."

After great exertions on the part of the well owners of the district, the fountain was eventually gagged, but not before 500,000 tons of oil had "spouted," equal to a loss at the current value of American petroleum of upwards of £1,000,000 sterling. But the record of the Droojba fountain was beaten in 1886, when a single well "spouted" as much as 11,000 tons of petroleum per diem; an amount equal to the aggregate daily yield of the 25,000 wells of America, the thousands of wells in Galicia, Roumania, and Burmah, and the shale oil distilleries of Scotland and New South Wales. As a result the market is now glutted, and the crude oil has been selling at times at the rate of fifty gallons for a penny!

We have not space to indicate all the many points of Mr. Marvin's interesting narrative, or to do justice to his account of the economic results which he thinks must inevitably follow from the prodigious source of wealth which Russia possesses in this wonderful district. It must be remembered that petroleum ton for ton is more potent than coal as a source of power. Hundreds of immense floating cisterns driven by petroleum furnaces are carrying this fuel across the Caspian and up the Volga, to be spread throughout Russia and Germany, and along the Baltic coasts. We learn from a recent Consular Report that pipe lines are being laid from Baku to Batoum: the Caspian and Black Sea Naphtha Conduit Company has now been formed, and the line is to be laid within the next four years. The conduit is to have a forked line on the Black Sea, reaching Batoum and Poti, and the capacity of the line is such as to admit of the daily passage of 1,200,000 gallons of naphtha. In a few years, therefore, this petroleum fuel will be scattered along the Mediterranean coasts and through Southern Europe. Possibly we may have it burning in our own Underground Railway before long. Indeed, as Mr. Marvin tells us, we shall surely see the Parsee back again at Baku, not to worship the Everlasting Fire, but for the purpose of buying lamp oil for the bazaars of India. What the effect of this intercourse will be on the future of India time will show. Meanwhile Russia is steadily making her way towards the gates of India, and Tchernayeff's road to Central Asia will be an accom-

plished fact before many years are past; and since the discovery of the new springs near the Mervi Kultuk Bay, the railway to Khiva will possess its own supply of fuel. A few days ago Mr. G. Curzon read an interesting paper to the Royal Geographical Society on the Transcaspian Railway, which must have opened many people's eyes to the development of Russia's power in Central Asia. In the meantime what are we doing with the sources of wealth in petroleum which we possess in Upper Burmah? Along the valley of the Irrawadi, and within 60 miles of the Rangoon-Prome railway, are enormous deposits of petroleum, probably as copious as those of America, if not so rich as those of Baku, and certainly capable of supplying the whole of India with light and fuel. Perhaps those capitalists who are so eager to rush into the ruby mines of Burmah might more profitably devote their wealth to exploiting the petroleum springs of that country, for it needs not the gift of prophecy to assert that Burmese petroleum in the long run will be certainly more precious than Burmese rubies.

We can heartily commend Mr. Marvin's book to all who are interested in the Central Asian question, for, as he says in the outset, petroleum is bound to become an important factor in that problem. Hannibal was said to have dissolved the Alps by vinegar. It is far more likely that petroleum will dissolve the sort of Chinese wall that our Governments are feebly setting up to keep the Russian trader and the *tchinovnik* out of India.

T. E. THORPE.

A TEXT-BOOK OF ELEMENTARY BIOLOGY.

A Text-book of Elementary Biology. By R. J. Harvey Gibson, M.A., F.R.S.E., Lecturer on Botany, University College, Liverpool. (London: Longmans, Green, and Co., 1889.)

THE above-named work is one of those which, as has been remarked in these pages (vol. xxxviii. p. 52), "the system of examining the whole world on a limited schedule . . . is bound to produce," and the essence of it is devoted to a consideration of those type-organisms which the examining body have set down for study. It contains 345 pages small octavo, and is divided into eight chapters, with an introduction. The first three chapters are devoted to generalities, and the last one to a "history of biology."

The author decries the "evils of the cram system," and proceeds at once to assert that "this must be my apology . . . for the introduction of so many speculations and explanations of casual relationship," while he claims for his treatise the special distinction that it deals "with the relationship of botany to zoology, and of both to the fundamental sciences of physics and chemistry." In fulfilling this determination the author gives, at the outset, a physico-chemical *résumé*. We regard the whole of this as out of place and superfluous, inasmuch as University students (for whom the book is written) will, if properly trained, have received the same information in a more tangible and authoritative form, at the hands of Professors of the special subjects. We strongly deprecate this growing tendency towards usurpation of the functions of others, especially when it

is seen that the sole object in view has here been that of incorporating tall-talk about that modern bogey "analbolism,"¹ with its antithesis, and about other heresies, which neither the pure physicist nor chemist would tolerate. Much that has been written of late under these and similar heads is now, by common consent, tabooed, as a mere garbling with ill-defined terms. As originally presented, it is, to say the least, over-reaching and often childish in its ambiguity: as diluted in the work before us, it bodes mischief whereby it becomes unendurable. It cannot be denied that for many a raw student such phantasies have an especial charm. In this work they are so interwoven with the more solid portions of the text as to bias and distort the intellect.

The "conditions of the environment necessary for the maintenance of life" and the "balance of Nature" are discussed and dismissed before the student is made familiar (in any but misleadingly general terms) with the constitution of the living organism. This we regard as a fatal error, revolting alike to common-sense and to established precedent, and we can only surmise that the adoption of so extraordinary a course has resulted from the influence of a wrong-headedness, at work upon the author's elementary training.

It will be seen that the author has, in our opinion, failed (and that, most probably, from faults not entirely his own) in the mode of treatment of his leading novelty. When first we realized the extent to which he had wandered into subjects not professionally his own, our suspicions were aroused as to whether he might not have erred proportionally within the limits of his recognized domain. The volume abounds in inaccuracies and misstatements. The methods of expression are frequently loose and contradictory: for example, on p. 293 we read that, in the frog, "the air is sucked into the interior of the body to the blood," and on p. 294 that the frog "forces the air into the lungs." On p. 145 a fair description is given of the bulb of the lily, whilst on p. 174 the same plant is "termed an annual." Things are too frequently declared to be "obviously," "naturally," or "clearly" so and so, and the author has yet to realize that with elementary students *nothing* must be taken for granted; while he has, on most points, grossly violated the inductive method (cf. the statements concerning the differentiation and structure of the nervous system, as successively presented on pp. 231, 232, 245).

The author's selection of types is unprecedentedly capricious. On the animal side, the Arthropod and Mollusk are omitted; while on the vegetable side, the description (p. 78) of an imaginary apical cell in *Spirogyra* implies complete ignorance of the type chosen for study. Nor must we disguise the fact that while the author tolerates those types now in vogue, he loses no opportunity of depreciating their educational value (pp. 219, 233, 264). We would remind him that these have served exceedingly well in the past, and that it is the manner of their manipulation by a certain class of teachers, rather than their constitution, which the unsuccessful student has cause to lament.

We deem detailed criticism superfluous, as there are no six pages in this book free from error, and, for a long suc-

¹ Defined by the author (pp. 336-40) as *consisting*, in the animal, of the processes of mastication, digestion, absorption, circulation, and assimilation.

cession, no two without inaccuracy. The following extracts will suffice. On pp. 265-66 we read that, in the frog, the alimentary system has become differentiated into "a buccal cavity, where the food is torn in pieces, or masticated; an œsophagus, or tube for the carriage of the triturated food (*sic*)," &c.; on p. 301 we are told that the occipital region of the skull, in the same animal, "consists of a floor and two side walls of bone (the basi- and two ex-occipitals)"; on p. 327, the oviduct of the frog is said to contain, when ready for oviposition, fertilized ova. Now as to the botanical side. *Penicillium* is selected as the type of Fungi, but the descriptions and figures apply throughout to *Eurotium*. In describing *Polytrichum*, his type of the Mosses, the author informs us (p. 103) that the leaves are "composed of almost undifferentiated parenchyma." A ridiculous attempt is made, three pages further on, to show homology between the archegonium of a moss and the conceptacle of *Fucus*; and the diagrammatic figure illustrative of the same can only bewilder the student, and mislead him as to the real structure and mode of development of the organs in question. Under the head of "cell-fusions," the statement is made (p. 149) that "the adjacent walls may have become completely broken down, as in tracheides": no well-tutored beginner needs to be reminded that this is in direct contradiction to the usually accepted definition of these structures. Finally, on p. 152, the *Duckweed* is referred to, and that in the most unfortunate manner conceivable, as a Dicotyledon. Misstatements such as these show the author to be ignorant of some of the most elementary truths dealt with in the most didactic handbooks in contemporary English literature. More the pity that the author should parade his indebtedness to the works of foreign writers.

One of the most conspicuous features of the book is the employment of a new nomenclature. The author was struck, early in his career, with the shortcomings of our conventional terminology; and, bolder than his fellows, he forthwith resolved to revolutionize the same. Order appears to dawn with the correlatives "Protozoa and Protophyta," "Metazoa and Metaphyta," but, when examined in detail, most of the author's substitutes are seen to be no better than their predecessors, and they consequently only complicate matters unnecessarily. We protest against this reckless use of new words. New and comprehensive terms are only to be accepted as landmarks in general advancement. Attempts to uproot a classical and time-honoured nomenclature, which are, like those before us, begotten only of youthful ambition, deserve no encouragement.

There would appear to be something seriously wrong in connection with the system which repeatedly produces books like that before us. Catering, as it does, for a prescribed curriculum, this one, the latest of its kind, will be eagerly sought by the examinees; and in their interests, if in none higher, it is time that something should be done to stem the tide. Similar complaints reach us from other sources, and it has been suggested in the pages of this journal (vol. xxxvii. p. 268) that the difficulty might be met by the establishment of "an Association to prevent the further publication of elementary works other than such as had been carefully revised and

approved of by a Publication Committee of the Association." No body of men have any such right to interfere with private enterprise; and the remedy proposed is wholly unscientific in principle, inasmuch as it would lay a sure foundation for systems of cliquism and popery, whose issue would be fatal to legitimate progress. Others there are who would seek the solution of the difficulty in an occasional substitution of the types chosen for teaching, and, in fact, such a change is already premeditated. This proposal cannot fail to meet with general approval, but it does not solve the problem; for, while no doubt it may, at the outset, insure to the examinee manuals of the better class, it will only prolong the evil day of publication of yet other inferior ones. The fault appears to us to lie not in systems, but in the individual. We are not yet rid of the old delusion that anybody can keep the children quiet. The infant-class is too often entrusted to the care of a novice, and with what results past systems of training have shown. "*Qu'est-ce qu'une grande vie?*" wrote de Vigny, with the rejoinder, "*Une pensée de la jeunesse exécutée par l'âge mûr.*" No one knows better than the English student that the production of an elementary text-book may constitute a leading feature in a great life. Such a work should be other than a medium in which the author airs his knowledge of fads and phantasies (most of which are sure to be wrong in the end) to the exclusion of fact and common-sense, and we hold its construction to be one of the most arduous of all possible tasks. It is, moreover, one for which a man is not fitted until ripened by long experience and meditation, and to none but the most experienced teacher would we intrust that awakening of the "thought of youth," which, if distorted at the outset, leads to certain failure. Here, to our thinking, lies the clue to the whole position. The matter is one for individual consideration. Upon the mind of the author of this work there has dawned the *pensée de la jeunesse*; in following it up, he has acted prematurely. Had he kept his ideas well in hand, others would have intersected them in the course of time, as his knowledge of (elementary) fact increased and as his experience ripened. He has done otherwise, and, in his eagerness for notoriety, has piled up, upon a flimsy foundation of words, a scant superstructure, the materials of which are ill-chosen and defective, and badly put together. G. B. H.

UNITED STATES GEOLOGICAL SURVEY.

Monographs of the United States Geological Survey.
Vol. XII. *Geology and Mining Industry in Leadville, Colorado.* By S. F. Emmons. Pp. 747, with Atlas of 35 folio Plates. (Washington Government Printing Office, 1886.)

THE operations of the United States Geological Survey, under the charge of Mr. S. F. Emmons, in the Leadville mining district, have become known to some extent to many geologists in Europe by personal examination on the ground, and more particularly from the valuable summary of their results which appeared in the Report of the Director of the Survey a few years back. But even those most familiar with the thorough manner in which work is done in the office of Mr. Emmons's division

at Denver can scarcely have been prepared for the mass of information which is presented to them in the present volume. Although the actual productive area of Leadville at the date of the survey was estimated at about one square mile, the study of a considerable part of the adjacent mountain districts was necessary in order to arrive at any general conclusions likely to be of value for practical purposes in regard to the mineral deposits; and therefore a district of about 15 to 20 miles of the western or Musquito Range of the Rocky Mountains has been surveyed, and mapped in very full detail on a scale of 2 inches to a mile. The interior parts of the mining region proper are treated more minutely on a scale of about 6 inches to a mile, and the geology and mine works on the three districts of Iron Hill, Carbonate Hill, and Fryer Hill are given on a scale of 1 to 1920.

From the maps and the sections which accompany each set, and which, in accordance with the excellent custom of the founder of the Geological Survey of Great Britain, the late Sir H. De la Beche, are constructed to the same scale both for heights and distances, it appears that the country described consists essentially of a series of ridges and furrows of sedimentary rocks resting upon an Archæan foundation forming the central mass of the Rocky Mountains. The most important member of this sedimentary series, the blue or metalliferous limestone, is a blue-gray dolomite of Lower Carboniferous age, which, at or near its contact with an overlying igneous sheet, known as the white or Leadville porphyry, is changed over considerable areas, but in an extremely irregular fashion, into a mass of clay and quartz charged with carbonate and sulphide of lead, chloride and bromide of silver, manganese and iron ores, which are obviously of secondary origin, and derived from the alteration of metallic sulphides. The upper surface of the deposit, being formed by the base of the porphyry sheet, is comparatively regular; but below, the boundary is exceedingly ill defined, the metalliferous mass—which in the principal mines resembles a brown garden-mould, mottled with dark-coloured patches in places—shading off into the unchanged limestone; it being, in fact, a pseudomorphous change of the latter rock by infiltration of metalliferous salts from the weathering of the overlying porphyry subsequently to the intrusion of the latter, and before the elevation of the Musquito Range—events which have been placed, as the results of detailed geological study, about the close of the Cretaceous period.

Since the year 1881, when the present Report was substantially completed, the ores of the Leadville district have changed very considerably, the more tractable carbonates and chlorides originally met with having given place to unchanged sulphides, with the result of complicating the processes of reduction. This circumstance detracts a little from the interest of the last section of the work, which is devoted to a very detailed description of the smelting processes as carried on at and near Leadville in 1880. This is due to the labour of M. A. Guyard, of the École des Mines, and for some time an assistant to Messrs. Johnson, Matthey, and Co. Unfortunately, he did not live to see the result of his work in print. Subsequently to the date of the Report, some of the larger smelting establishments were removed to localities closer to the fuel-supplies on the eastern side of the Rocky Mountains, and con-